WRITTEN STATEMENT
OF THE
MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION
ON THE
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S DRAFT CONTROL MEASURES FOR STATIONARY DIESEL ENGINE WHITE PAPER

August 23, 2006

The Manufacturers of Emission Controls Association (MECA) is pleased to respond to the New Jersey Department of Environmental Protection's (NJDEP) request for comments on the Draft Control Measures for Stationary Diesel Engine white paper. MECA supports NJDEP workgroup's recommendations to reduce particulate matter (PM) and nitrogen oxides (NOx) from in-use and new stationary diesel engines ≥ 50 horsepower and to require the use of ultra-low sulfur diesel fuel in these same stationary engines.

MECA firmly believes that the emission control technologies that will be needed to help meet the emission reduction goals stated in the Draft White Paper are available. The PM and NOx control technologies that are proposed to be installed on stationary diesel engines greater than 50 hp are being used today on on-road and off-road applications (including many stationary diesel engines) in California and elsewhere. NJDEP workgroup's proposed emission reduction strategies outlined in the Draft White Paper will provide important and rapid PM and NOx emission reduction benefits and will provide an opportunity to demonstrate the effectiveness of a retrofit strategy for stationary diesel engines. Requiring that these stationary diesel engines use ultra-low sulfur diesel fuel will enable the use of the best available exhaust emission control technologies and maximize the emission reductions that can be achieved from both new and in-use stationary diesel engines.

MECA is a non-profit association of the world's leading manufacturers of emission control technology for motor vehicles. Our members have decades of experience and a proven track record in developing and manufacturing emission control technology for a wide variety of on-road and non-road vehicles and equipment. A number of our members have extensive experience in the development, manufacture, and commercial application of PM and NOx emission control technologies for stationary engines. Our members have invested and continue to invest significant resources in developing and verifying diesel retrofit technologies for use on the whole range of in-use diesel engines currently operating in U.S., including on-road, non-road, and stationary sources.

Technologies to Reduce Diesel PM and NOx Emissions

A number of advanced emission control technologies exist today to significantly reduce PM and NOx emissions from new and existing diesel engines. These include diesel particulate filters (DPFs), diesel oxidation catalysts (DOCs), selective catalytic reduction (SCR), and NOx adsorbers.

Diesel Particulate Filters – Diesel particulate filters (DPFs) are commercially available today. Over 200,000 on-road heavy-duty vehicles worldwide have been retrofitted with passively or actively regenerated DPFs. In addition, over two million new passenger cars have been equipped with DPFs in Europe since mid-2000, and starting in 2007 every new heavy-duty on-road engine sold in the U.S. and Canada will be equipped with a high-efficiency DPF to comply with EPA's 2007 on-road diesel emission limits. DPFs are also now available on all new heavy-duty on-road diesel engines sold in Japan. The operating and durability performance of DPFs has been very impressive. For example, a growing number of on-road DPF-equipped heavy-duty vehicles have been successfully operating for several 100,000 miles or more. Examples of successful diesel retrofit programs employing DPFs include urban transit agencies in many large U.S. and European cities, the New York City and city of Los Angeles Departments of Sanitation fleets, which have successfully retrofitted refuse trucks with filters, and thousands of school buses across the U.S. DPFs have also been successfully retrofitted in a number of non-road applications including applications on stationary engines, construction equipment, mining equipment, and cargo handling equipment used at several large port facilities in the U.S.

High-efficiency DPF technology can reduce PM emissions by up to 90 percent or more, ultra-fine carbon particles by up to 99+ percent and, depending on the system design, toxic HC emissions by up to 80 percent or more. A number of manufacturers have already verified high efficiency (Level 3, > 85% PM reduction efficiency) retrofit DPF technologies for stationary engine applications using the California Air Resources Board's retrofit verification protocols (see http://www.arb.ca.gov/diesel/verdev/verifiedtechnologies/stationary.htm). These include both actively (using a diesel fuel burner) and passively (catalyst-based regeneration that requires minimum exhaust gas temperatures) regenerated DPF technologies for the oxidation of trapped soot. For catalyst-based DPF technologies, the use of ultra-low sulfur diesel fuel is critically important to maximizing the PM reduction efficiency and durability of these technologies.

New "partial" filter technologies are also emerging for diesel retrofit applications. These "partial" filters make use of wire mesh supports or tortuous metal substrates that employ sintered metal sheets. Three "partial" filter designs have been verified by California's ARB as Level 2 PM reduction technologies (PM reduction efficiency from 50 to 85 percent) and one "partial" filter design that employs a fuel-borne catalyst for assisting in soot regeneration has been verified by the U.S. EPA. One of the ARB Level 2 verified "partial" filters is specific to applications on stationary engines while the other ARB and EPA verifications for "partial" filters are applicable to a range of on-road diesel engines. These "partial" filter designs are less susceptible to plugging and can offer PM reduction efficiencies in the 60 to 75 percent range.

Development work is underway to further enhance the performance of filter system designs. For example, work continues on developing and implementing additional active filter regeneration strategies that will expand the applications for retrofitting DPFs. Also, development work on filter materials and designs to further enhance filter system durability and to further reduce backpressure are under development. Manufacturers are also developing DPF options that minimize NO_2 emissions in systems that make use of NO_2 for filter regeneration. New, improved DPF systems continue to enter the diesel engine OE and retrofit market.

Diesel Oxidation Catalysts (DOCs) – DOC technology is available today and represents a cost-effective PM control strategy. Over 250,000 non-road vehicles and equipment, including mining vehicles, skid steer loaders, forklift trucks, construction vehicles, cargo handling equipment, marine diesel engines, and stationary engines, as well as over 50,000,000 diesel passenger cars and over 1.5 million trucks and buses worldwide have been equipped with DOCs. Control efficiencies of 20 to 50 percent for PM, up to 90 percent reductions for carbon monoxide (CO) and hydrocarbon (HC), including large reductions in toxic hydrocarbon species have been achieved and reported in tests of DOCs on a large variety of on-road and non-road diesel engines. With respect to particulate emissions, the wide range of PM reductions observed with DOCs reflects the fact that DOCs oxidize soluble hydrocarbons associated with PM (the so-called soluble organic fraction [SOF] of PM). The SOF content of PM is related in part to the oil consumption characteristics of diesel engines.

Selective Catalytic Reduction (SCR) Technology – SCR technology is a proven NOx control strategy. SCR has been used to control NOx emissions from stationary sources for over 15 years. More recently, it has been applied to select mobile sources including trucks, marine vessels, and locomotives. In 2005, SCR using a urea-based reductant was introduced on a large number of on-road diesel heavy-duty engines to help meet the Euro 4 heavy-duty NOx emission standards. More than 10,000 new heavy-duty truck engines are operating in Europe equipped with SCR systems that use urea as the reductant for reducing NOx emissions. SCR is also being given serious consideration by engine manufacturers for complying with future on-road heavy-duty diesel engine emission standards in both the U.S. and Japan (in the 2009-2010 timeframe). Applying SCR to diesel-powered engines provides simultaneous reductions of NOx, PM, and HC emissions. Since the mid-1990s, SCR technology using a urea-based reductant has been installed on a variety of marine applications in Europe including ferries, cargo vessels, and tugboats with over 100 systems installed on engines ranging from approximately 450 to 10,400 kW. These marine SCR applications include the design and integration of systems on a vessel's main propulsion engines and auxiliary engines. Most recently an SCR system has been successfully installed on one of New York City's Staten Island ferries. A smaller number of SCR systems have also been installed on diesel locomotives, largely in Europe.

SCR has also been combined with DPF technology to provide simultaneous large reductions in NOx and PM emissions as well as reductions in CO and hydrocarbon emissions. In California, a 300-ton gantry crane powered by a turbocharged, after-cooled diesel engine rated at 850 kW was equipped with such a combined emission system in 2001. The expected emission reductions were an 85 percent reduction of particulate matter and a 90 percent reduction in NOx. A few combined SCR/DPF systems have also been installed on stationary diesel engines used for power production including six Caterpillar 3516B engines operating in southern California. Volvo AB, in the summer of 2004, launched 27 diesel transit buses in Sweden that are operating with a combined SCR/DPF system to reduce PM and NOx emissions below the European Euro 5 heavy-duty emission limits that do not come into force until 2008. A number of small test fleets of heavy-duty over-the-road diesel vehicles are also operating within the U.S. to demonstrate the capabilities of combined PM and NOx control using SCR and DPFs. DOE's (U.S. Department of Energy) APBF-DEC program included the evaluation of two different combined SCR/DPF systems on a 12 liter heavy-duty diesel engine. Results on this program were reported at the 11th Annual DEER (Diesel Engine Emission Research) Conference during the week of August 21,

2005. These results included the operation of these two different SCR/DPF systems for 6,000 hours of durability with emission performance near the EPA 2010 heavy-duty on-road emission limits. A final report on this APBF-DEC project is expected in 2006 detailing the performance of these SCR/DPF systems through 6,000 hours of engine aging.

NOx Adsorber Technology – MECA believes that NOx absorber technology will also be an available NOx control strategy to help reduce NOx emissions from new diesel engines. NOx adsorber catalysts are currently being used commercially in light-duty gasoline direct injection (GDI) engines sold in Europe and Japan. This technology continues to undergo extensive research and development in preparation for the U.S. 2010 on-road heavy-duty and Tier 4 non-road diesel engine requirements. The progress in developing and optimizing this technology has been extremely impressive. Indeed, the Clean Diesel Independent Review Panel, charged by EPA to assess the technological progress in meeting the 2007/2010 standards, concluded in latter part of 2002, that NOx adsorber technology development was on track to help meet the on-road heavy-duty engine standards and no technological roadblocks were identified. Information presented at DOE's 11th Annual DEER Conference during the week of August 21, 2005 summarized information on a heavy-duty NOx adsorber/DPF system test program that was run as part of DOE's APBF-DEC program. In this test program a 90 percent NOx efficiency level was maintained through 2000 hours of durability including numerous high temperature desulfation events. NOx adsorber performance and durability is a strong function of diesel fuel sulfur levels. The use of ultra-low sulfur diesel fuel is a critically important enabler to the use of this technology on new diesel engines.

The current focus of NOx adsorber technology development and optimization is on: 1) expanding the operating temperature window in which the technology will perform, 2) improving the thermal durability of the technology, 3) improving the desulfurization methods and performance, and 4) improving system packaging and integration. The progress being made in these areas continues to be impressive. In light-duty applications, several automobile manufacturers are conducting in-vehicle tests with NOx adsorber/DPF systems (see for example, SAE Paper No. 2004-01-1791 for EPA's emission tests of prototype vehicles equipped with NOx adsorber/DPF systems) and Toyota has introduced a diesel-powered passenger car in Europe and a diesel-powered light-duty truck in Japan with a combined NOx adsorber/DPF system in late 2003. Recently Mercedes-Benz announced its plans to introduce a diesel passenger car into the U.S. market in late 2006 equipped with a NOx adsorber/DPF system.

Conclusion

In closing, we believe that there are proven diesel exhaust emission control technologies including high efficiency, diesel particulate filters and selective catalytic reduction technology are available for achieving significant reductions in PM emissions and NOx emissions from existing and new stationary diesel engines. These technologies can be used to help New Jersey achieve significant PM and NOx emission reductions from these engines as outlined in the NJDEP workgroup's white paper. Our industry is prepared to do its part to help meet the diesel emission reduction strategies proposed in New Jersey's Draft Control Measures for Stationary Diesel Engines white paper.

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